

RESEARCH NOTE LS-34

LAKE STATES FOREST EXPERIMENT STATION • U. S. DEPARTMENT OF AGRICULTURE

**Germination of Yellow Birch Seed Following
Natural Stratification in Upper Michigan**

Yellow birch (*Betula alleghaniensis*) seed ripens in the fall and is deposited over the fall and winter months.¹ Germination has been observed throughout the summer months. Dormancy of the seed can be broken by exposure to a cool-moist environment. As Joseph² showed in laboratory studies, the temperature of this environment and the length of exposure to it affect germination.

Since yellow birch seed is released over a considerable period of time, it is exposed to a variety of environments and is subject to dormancy-breaking conditions for different lengths of time.

A study was conducted during the winter of 1961-62 and the following growing season to determine what effect natural stratification had on germination.

METHODS

Seed used for the study was collected from a 120-year-old, upland-site yellow birch tree of good vigor and kept in cold storage for a year. A test indicated 50-percent germination.³

¹ Benzie, John W. Sugar maple and yellow birch seed dispersal from a fully stocked stand of mature northern hardwoods in the Upper Peninsula of Michigan. U.S. Forest Serv., Lake States Forest Expt. Sta. Tech. Note 561, 1 p., 1959.

² Joseph, Hilda C. Germination and vitality of birch seeds. Bot. Gaz. 87: 127-151. 1929.

³ The proportion of seed germinating in 30 days on moist sand under laboratory conditions. Seed was stratified for 30 days at 41° F.

Seeds were placed three or four layers deep in small nylon mesh bags and set out in a hardwood stand at the Upper Peninsula Experimental Forest at Marquette, Mich. during November, December, January, and February. Those placed in November were on the ground, while in later months the bags were placed on the snow. Snow depth increased to 2 feet in February. Bags were picked up after snowmelt just prior to testing.

Six hundred seed from each stratification period were counted and placed on moistened perlite in three covered petri dishes, 200 to a dish. On May 10, the dishes were placed outside in a closed hardwood stand. A duplicate set of 600 seed was tested in the laboratory. Water was added to all dishes periodically to prevent drying out.

Temperatures were recorded outside with maximum and minimum thermometers. Between May 10 and July 2 the average maximum temperature was 81° F., while the average minimum was 44°. The range of minimum temperatures was 30° to 62° F. Freezing temperatures were recorded as late as the end of June. Temperatures in the laboratory were a constant 75°.

RESULTS

Natural stratifications produced no statistical differences in total germination percent when tested under room temperatures but did result in different rates during the first few days (table 1).

TABLE 1.—*Cumulative percent germination in the room temperature test*

Month of stratification	First day	Fourth day	Tenth day	Total
November	20	35	45	49
December	24	42	51	52
January	5	33	49	53
February	4	32	49	53

Although some seed from each month of stratification germinated the 1st day, numbers germinating on that day were higher for the November and December lots. After 4 days, the number germinated was about the same for all stratification times. For those tested in an outdoor environment, however, the differences between months of stratification were marked (table 2).

Germination began in the November and December lots after 19 days; the January and February lots started germinating at 21 and 23

days respectively. The November lot reached its peak rate 3 days after germination started. December reached its peak rate 21 days after germination started, and the others may not have reached a peak by the time observations ended (July 2).

DISCUSSION

Joseph (see footnote 2) speculated that natural stratification of birch seeds would allow easy spring germination. The results of this test indicate that only part of the yellow birch seed germinate in the spring in cool, moist environments, while part will not germinate until later in the summer or fall. In the latter case, germination would depend on favorable moistures, which are often uncertain and of short duration in the summer months. Summer germination may result in greater mortality during hot, dry periods. Also, those seedlings produced by such germination may be less sturdy and less able to withstand the leaf fall which is often cited as an important cause of yellow birch mortality.

TABLE 2.—*Cumulative percent germination in an outdoor environment¹*

Month of stratification	0 - 18 days	21 days	31 days	39 days	53 days
	(May 10-May 28)	(May 31)	(June 10)	(June 18)	(July 2)
November	0	7	12	21	28
December	0	3	13	35	44
January	0	*	1	6	12
February	0	0	0	2	2

1/ Curved values

* Less than 1 percent